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The following information is taken from the applicant's documentation

Application for testing according to § 44 PatG has been submitted

Tire Curing Press

The (1) tire curing press has a machine head (3), being able to slide along at least two guide posts (10), and a machine base (2), which is positioned rigidly in relation to the foundation level (7) [original erroneously states 17]. The guide posts (10) are connected rigidly to the machine head (3) and are able to slide into the machine base (2). The guide posts (10) residing in the machine base (2) consist of two locking positions (13, 14) located within a distance from each other, with axially effective upper and lower contact surfaces (17, 16) designed to transfer axial forces. Each guide post (10) in the machine base (2) consists of locking elements (18), which exhibit a shape matching the shape of the locking positions (13, 14) on guide posts (10). These may be engaged with the locking positions (13, 14) and are designed to accept axial forces from column (10) or return forces to same. Each guide post (10) is provided with a surrounding trunk

piston cylinder (19), which is designed to exert a force onto the locking elements (18) in such way, whereby the lower die section (5) and upper die section (8) of the tire curing form (6) are being forced together with the operationally required pre-loading pressure.

[begin page 1]

Description

The invention pertains to a tire curing press with a machine head, which is able to slide along at least two guide posts, and a machine base, which is positioned rigidly in relation to the foundation level, whereby the machine head is designed to hold the upper die section of the tire curing form and the machine base to hold the lower die section of the tire curing form

One such tire curing press is known from DE OS 25 31 383. For this well known press, four guide posts are rigidly locked between the machine head, which is provided with an actuating mechanism for the relative motion between the upper and lower tool head, and the machine base of the press. The upper tool head is able to slide along the rigid guide posts, while the lower tool head is mounted to the machine base. The closing force for the tire curing form is supplied by the central actuating mechanism. Considering that this actuating mechanism, as in the case of an hydraulic design, is required to provide a long stroke as well as a high closing force, it makes this design very expensive. Also the four guide posts and the cross members (actuating mechanism, upper press surface and machine base with lower press surface) relate to an expensive equipment outlay.

An additional tire curing press is known from DE 34 44 688 C2, whereby the upper tool head, which is able to slide with the aid of a central guide post in a rigid machine head, is being moved up and down by several long stroke cylinders. The lower tool head may be pressed against the upper tool head with the aid of a short stroke cylinder, positioned on the press frame, designed to provide the required closing force for the tire curing form. The disadvantage of this well known design is again the expensive equipment outlay. A total of four cross members (upper cross arm, upper pressure plate, form support and press frame) are required in this design. Also the tension relieving annealing process for the high weld frame with side walls requires a considerable outlay.

The object of the present invention therefore is to design a structurally more simple tire curing press of the type mentioned at the beginning, while maintaining the same functionality.

This task, according to the invention, will be solved in a way by which the guide posts are being rigidly connected to the machine head and their lower ends are able to slide along guide posts in the machine base, such that the ends, carried by the machine base, consist of two locking positions located within a distance from each other, with an axially effective upper and a lower contact surface designed to transfer axial forces, such that for each guide posts in the base there are holding or locking elements provided, which exhibit a shape matching the

shape of the locking positions of the guide posts, which may be engaged with the locking positions, which are designed and are capable (in the engaged position) to accept axial forces from the guide posts or return those forces to same, and that each guide post is provided with a surrounding trunk piston cylinder, which is designed to exert a force onto the locking elements in such way, whereby the two die sections of the tire curing form are being pressed together with the operationally required pre-loading pressure.

According to the present invention, the tire curing press requires only two cross members, the machine head and the machine base. The guidance of the machine head is accomplished exclusively by means of guide posts, of which only two are required. The guide posts in addition are being used as tension rods, designed to supply the closing force, thus allowing the machine frame to be kept relatively small. The trunk piston cylinders, with their short stroke, allow for a space saving construction.

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Additional beneficial embodiments of the invention result from the secondary claims. The locking positions of the guide posts, in the exemplary embodiment of the invention, are advantageously provided with circular grooves with corresponding upper and lower surfaces.

The locking elements are preferably designed for each guide post as a pair of movable parts on opposite ends of the guide post, which are provided with internal grooves, which correspond to the locking positions of the guide posts. The internal grooves are in form of an arch, extending over an angle of about 180°.

It is advantageous, if the movement of the locking elements proceeds radially in a straight line, since this can be achieved with simple means.

A pneumatic cylinder is provided for each element, designed to move the locking elements from the not engaged position to the engaged position and back again, which assures an operationally safe activation.

The locking position at the out most, free end of the guide posts is provided with a flange, which is larger in diameter than the remaining part of the guide post. This assured a reliable travel limit, even with open locking elements.

It will also be self evident, that more than two locking elements may be provided to engage with the locking positions, whereby the internal grooves in this case will extend over a smaller angle.

Following is an exemplary embodiment of the invention, as based on the drawings, explained in detail:

Fig. 1 -.a tire curing press (1) with closed tire curing form (6) shown as a partially sectioned font view,

Fig. 2 - side view of the tire curing press (1),

Fig. 3 - longitudinal section of a locking device,

Fig. 4 - cross section of the locking device along the line IV-IV,

Fig. 5 - the lowest locking position of the guide posts.

The tire curing press 1 according to Fig. 1 consists of a machine base 2 and a machine head 3. The machine base 2 is supported by machine frame 4 and carries the lower die section 5 of the tire curing form 6 and the machine head 3 carries the upper die section 8 of the tire curing form 6, which in the described embodiment is designed as a segmented forming tool.

On the machine head 3 are mounted two cylindrical guide posts 10, aligned parallel with the centerline of press 9, which is inserted into the machine base 2, and which is able to slide along the same and facilitate a linear motion of the machine head 3 and the upper die section 8 in direction of the centerline of press 9. The energy for the stroke of the machine frame 4 is supplied by the long stroke cylinders 12, which are mounted in the machine base 2.

The columns 10 for the machine head 3, fashioned as guide posts, are provided at their lower end with locking position 13 and locking position 14, at a distance from each other. These locking positions are provided with two circular grooves 15 sunk into the surface of the posts, with each one pair of upper and lower face areas 16,17, to transmit forces in axial direction.

In order to mechanically lock or secure the guide posts 10, and thereby position the axial elevation of the machine head 3 and along with it the upper die section 8, each guide post 10 is provided with two locking elements 18, which each are provided with internal grooves 18' forming an arch of about 180° and which may be positioned horizontally to engage the circular grooves 15 with the locking positions 13, 14.

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A so called "hollow piston" cylinder 19 with a ring type piston 20 is positioned around each guide post 10 at the underside of machine base 2. The ring type piston 20 exhibits a circular flange 21, located in the cylinder chamber of the trunk piston cylinder 19, which prevents the piston from dropping out of the cylinder housing. The circular flange 21 in addition provides a small circular piston area for pulling in the piston. Mounted to the part of the ring type piston 20, protruding from the cylinder housing, is a retainer disk 22 with linear guiding grooves 23, the common vertical symmetric plane of same leading through the axis of guide posts 10 and with which the locking elements 18 are able to slide in linear direction and opposite to the axis of guide posts 10 and away from same. Two pneumatic cylinders 24 are mounted below the retainer disk 22, each of them moving one of the locking elements 18. The stroke length of piston 20 inside the trunk piston cylinder 19 is relatively short and amounts essentially to

1.2 times the distance of the grooves and/or the distance of the neighboring upper and lower face areas 16, 17.

The upper locking position 14 is designed to establish the heating position. It contains a number of circular grooves 15, to be able to lock in different vertical positions for different tire curing forms 6. The trunk piston cylinder 19 is being loaded down in this position, in order to exert the operationally required closing force unto the tire curing form 6. The guide posts 10, during this loading phase, perform the function of a tension rod.

The lower locking position 13 serves to lock and/or position the upper position of the machine head 3 for loading and unloading of the green tire and/or of the finished cured tire. In order to limit the upper most position, the lower most locking position 13 must be provided with a circular flange 25, having a diameter larger than the guide post 10.

The locking position is being established by limit switches, not shown.

Listing of drawing references.

(1) tire curing press

(2) machine base

(3) machine head

(4) machine frame

(5) lower die section (5)

(6) tire curing form

(7) foundation level

(8) upper die section (5)

(9) centerline of press

(10) column(s)

(11) bushings in 2 for 10

(12) long stroke cylinder

(13) locking position (10)

(14) locking position (10)

(15) circular grooves (13,14)

(16) upper face area (15)

(17) lower face area (15)

(18) locking element(s)

(18)' inner groove (18)

(19) trunk piston cylinder

(20) ring type piston (19)

(21) circular flange (20)

(22) retainer disk

(23) linear guiding grooves on 22 for 18

(24) pneumatic cylinder (13)

(25) circular flange (13)

(groove distance

[begin page 4]

Patent Claims

1. A tire curing press (1) with a machine head (3), which is able to slide along the guide posts (10) and a machine base (2), which remains stationary in relation to the foundation level (7) [original erroneously states 17], whereby the machine head (3) supports the upper die section (8), and the machine base (2) supports the lower die section (5) of the tire curing form (6), where the guide posts (10) are rigidly connected to the machine head (3), and their lower ends are ably to slide in the machine base (2), such that the ends of the guide posts (10), sliding in the machine base (2), contain locking positions (13, 14), located at a distance to one another, for the transfer of axial forces, that there is a locking element (18) in the machine base (2) for each guide post (10), which are designed to correspond to the locking positions (13, 14), which can be engaged with the locking positions (13, 14), and, in their engaged state, are suitable to accept axial forces from the guide posts (10) and/or to transfer such forces, and that each guide posts (10) is provided with a circular trunk piston cylinder (19), which is suitable to exert a force unto the locking elements (18) such, that both the lower and upper die section (5, 8) of the tire curing form (6) are being forced together with the operationally required pre-loading pressure.

2. A tire curing press, according to claim 1, where the locking positions (13, 14) exhibit circular grooves (15) with upper and lower face areas (16, 17) designed to transfer axial forces.

3. A tire curing press, according to claim 2, where the locking elements (18) for each guide post (10) are designed at least as two parts, movable from the opposite end of the axis of the guide posts (10), with circular grooves (15) of the

locking positions (13, 14) corresponding to internal grooves (18') on the guide posts (10).

4. A tire curing press, according to claim 3, where the locking elements (18), are able to slide in a straight line radially on the axis of the guide posts (10).

5. A tire curing press, according to claim 4, where the locking elements (18) may be moved individually by a pneumatic cylinder (24).

6. A tire curing press, according to one of the preceding claims, where the locking position (13) at the free end of guide posts (10) exhibits a circular flange (25), the diameter of which is larger than the diameter of the guide posts (10).

In addition 3 pages of drawings.